Why SPC Software Matters

ZONTEC

Introduction

Many businesses today are running lean. Individuals are now doing jobs that required multiple personnel in the past, including those in Quality. Each day is spent putting out fires, dealing with suppliers, customers, auditors, upper management, and now you're tasked with finding the ideal Statistical Process Control (SPC) software that is right for your business. This whitepaper was designed to aid you in understanding the fundamental rules and methodology of SPC, items to look for, warning signs to be aware of, and the importance in choosing the right SPC software solution. If the wrong decision is made, the consequences may negatively affect your business and those you do business with for years to come.

SPC Experience Matters

Zontec began and has continued to work with customers in live production environments to develop SPC software that not only meets their customers' needs but also serves as a competitive advantage. We have a proven history and track record that our methodologies and rules are correct. Fundamental to our philosophy is that we enable our customers to build superior products, minimize the impact of production errors on consumers to benefit the society as a whole.

1. Zontec started by training manufacturers on the production floor the correct SPC methodologies and rules. Zontec immediately recognized that what manufacturers needed was SPC software engineered in a logical, consistent and easy-to-use manner that enabled all levels of the organization (operators, managers, engineers as well as mid and upper management) to immediately view the status of production.

2. Zontec also recognized that all user levels needed to understand the fundamentals of Statistical Process Control (SPC) to see how it could help them identify problems before they affect the production process. When detecting incorrectly these conditions could have dire consequences for the business. That is why Zontec wrote *The Book of SPC*.

3. Recognizing that different sized companies have different needs, Zontec developed the Synergy SPC Software Product Suite.

4. As industry needs and technology changed, Zontec has consistently kept pace and in some cases predicted what would be needed. Zontec has rewritten its software numerous times over the years to take advantage of new technology to enable its customers to integrate new equipment, new measurement devices and new automation tools into the production process easily.

5. This has resulted in Zontec being the leading-edge SPC software provider that accommodates the ever-changing production environment. For example, when an out-of-specification condition occurs, automatic emails are sent to appropriate personnel immediately.

6. Because we recognize that technology and production environments are ever-changing, Zontec is committed to an aggressive product development schedule for each of its products. The Synergy software is created, tested, documented and totally supported within the company. This gives Zontec complete control over the product development of our products.

7. Under the annual service agreement, if the customer decides to upgrade to the next level of the Synergy Product Suite, they can do so at minimal cost through our 100% Investment Retention program. They will be able to access all their previous data in the new product, minimizing production interruptions.

Customers rely heavily on their SPC software to give them accurate information to meet their customer requirements the first time and continue to improve their processes. Therefore, when looking at or using SPC software, it is vital to evaluate the foundation of the SPC software. Zontec has the statistical background and experience to develop SPC software to enable customers to meet requirements and provide appropriate documentation immediately. When evaluating SPC software, it is important to see if the SPC standard rules are performed correctly or customers are vulnerable to costly recalls, losing their customers, and jeopardizing their business.

SPC Methodologies and Rules Matter

Statistical methods are employed to continually improve process performance and efficiency. Statistical Process Control is applied when analyzing a process to correctly identify special cause from common cause variations. When identified incorrectly, one is either over adjusting by correcting for common causes or not taking action for special cause which leads to an unpredictable process and decreased efficiency. An effective means of detection must be employed that follows the standard SPC methodologies and rules.

When looking at SPC software it is critical to look below the surface. Care should be taken to ensure that the software adheres to the fundamentals of SPC. Assuming that software employs correct methods of detection and calculations can be a very costly mistake. Key questions should be asked when looking at different SPC software vendors regarding the standards followed, statistical methods employed, as well as other capabilities of the software.

Control and Specification Limits

When monitoring SPC variable data there are two sets of limits defined, specification limits and control limits. Specification and control limits are distinct values that should not be viewed as one and the same. Specification limits are determined by customer requirements and determines if the product is acceptable to ship. A run chart is used to compare each individual observation value with the specification limits. Control limits are based upon process performance and calculated using historical data. A control chart is used to compare the average of the observations, dependent upon sample size, with the control limits. Only in the

event that the sample size is equal to one, are the run charts and control charts plotting the same data. Comparing an average of the individual observation values with the specification limits provides no information about the process, whether the point falls inside or outside the specification limits. For this reason, the specification limits should not be present on the control chart with a sample size greater than one.

Control Limit Calculation

Control charts have been proven as the most effective means of detecting special causes during production. However, if a control chart is not setup and monitored correctly, it is not only ineffective but can actually degrade process performance resulting in substantial loss through increased scrap, rework and downtime. Standards have developed in regards to the calculation and recalculation of control limits since they are critical in monitoring process control.

Control limits are calculated values based upon previous process performance, historical data. When control limits are initially calculated, all samples should be contained within the trial limits. If any sample(s) fall outside the limits, they should be withheld from the calculation. Once the control limits are established, the limits should be extended for ongoing monitoring of the process. Only in the event that a change is made to the process in efforts to reduce common cause variation, should control limits be recalculated.

Automatic Control Limit Calculation Myth

The automatic calculation of control limits is prohibited by Standard SPC methodologies and should not be incorporated into any SPC software program. Control limits are critical decision aids when monitoring a process. If not calculated correctly, they will have damaging effects on the process and negate any attempts of successful process improvements. For this reason, when investigating SPC software's capabilities the methods for control limit calculation is key, but there are also several other areas to examine to ensure standard SPC guidelines are followed.

Validation Questions

Demand that SPC software vendors supply supporting documentation as evidence in response to the questions listed below.

1. Is the SPC software able to define a specific range of historical data to include in the calculation of control limits?

2. Does the calculation of control limits use the estimated or calculated value of sigma?

3. Can samples be excluded when calculating control limits with reason noted and if so is this visually indicated on the control chart?

4. Will the software allow extending the calculated control limits?

5. Is process status clearly indicated and displayed on the control chart?

6. What control trend tests are available and which trend test rule was applied?

7. Was a cause assigned and corrective action taken to trending or out of control data point(s)?

8. When are control limits recalculated and logged in the report?

9. Can multiple sets of control limits be calculated, extended and displayed on the chart?

10. Can process data be reviewed to see how it has changed over time?

11. Are process capability charts able to be generated in the software with both $+/- 3\sigma$ and $+/- 6\sigma$ displayed?

12. Are automatic email alerts available in the software to notify the appropriate personnel of out-of-spec and/or out-of-control conditions?

The design and execution of Six Sigma projects require a series of sequenced events that absorb much time and energy from the personnel involved. Implementing an SPC software program is essential part of this process. Before deciding on an SPC software program to use, it is critical to thoroughly investigate the software and the statistical and probability methods employed. Not adhering to standard guidelines when analyzing SPC data negatively affects the process and has a detrimental effect on any process improvement efforts.

Consequences of Incorrectly Developed SPC Software

Each and every important decision we are faced with needs to be based on a true and accurate representation of the facts. If decisions are based on questionable interpretation, the consequences can be significant. Choosing an SPC software solution, as a partner in your business, should be no different. Don't fall victim to a solution that contains outdated technology or has been over promised. Your decision should be based on choosing a current solution that is rooted in strong SPC fundamentals, methodologies and applies SPC rules correctly.

While it may be easy to say the cost of a poor choice may be "cost" itself, it goes far beyond the economic impact. Yes, everything does eventually lead back to financial loss, but the impact can also be felt in five critical aspects of your business if the SPC methodology and rules are incorrectly applied. We will outline those areas of your business.

1. Product/Process

   Defects, scrap, and rework are unfortunately often dismissed as a "cost of doing business" and measured in relative terms. These costs are real and can easily multiply due to the time it may take to rework and/or start over. By utilizing a sound SPC methodology, continuous improvement would naturally lead to a steady improvement in this most obvious vacuum of resources.

2. Time and Productivity

   Another major consequence of using SPC incorrectly can be the affect it has on time management and productivity. This can be seen in terms of being "reactive vs. proactive", time spent on making unnecessary adjustments, problem solving, production being shut down, decreased efficiency, incorrect identification of root cause, focusing on the wrong area of the process, or over-adjustment to production.

3. Perception and Judgment

   Critical to decision making is having a true insight into production conditions. If decisions are being made on incorrect analysis of production conditions, special causes of variation cannot be correctly identified and reacted to properly. The result is the creation of a highly unpredictable and/or unstable process which can easily be felt company wide.

4. Relationships with Customers and Suppliers

   As your process becomes unpredictable and unstable, another real possibility is the potential for a negatively impacted relationship with both customers and suppliers. Failed audits, customer penalties, recalls, loss of opportunity, credibility and reputation, and soured relationships are all situations we'd like to avoid.

5. Culture

   Paramount to the success of any business is its culture. If conflicts arise as a result of production or quality issues, the entire culture of an organization (including Quality, Production, and Management) can be negatively affected. This negativity can lead to a loss in credibility, confidence, trust, and demoralize a team.

Every day, businesses around the world rely on their SPC software to help them continually improve their processes and products, run more efficiently, provide a perspective into their production, solidify their relationships with their customers and suppliers, and maintain a positive culture. At first glance, it may appear that SPC or statistical software solutions are all the same; they are not. Choosing an SPC Software solution can have a dramatic impact on your business. Make sure your decision is based on a solution that will provide you the most accurate representation of the facts of your production process, is based on a solid foundation of SPC methodology and rules, and applies the methodology and rules correctly. You, your management, and your customers, will be glad you did.

Why SPC Software Matters

As we've discussed in this whitepaper, implementing SPC methodology and rules into the software is a complex process. Unless you are an expert, you may miss how the SPC methodologies and rules must operate within the SPC software. Compliance to the fundamentals of SPC, based on knowledge and experience, must be the foundation of the software. We've provided you with a list of salient questions to ask any software vendor you are considering, shown you an example of a highly circulated myth related to SPC software, and highlighted five critical aspects of your business that may be affected by your SPC software choice, all to aid you in your decision making process. We truly hope that this whitepaper has provided you the thoughts and tools necessary in helping you choose the best SPC software for both your business, and those you do business with.

About Zontec

Since 1983, Zontec has been providing statistical process control (SPC) software to industry-leading companies globally. Zontec is highly respected for its innovation and for integrating new technologies to help businesses address quality issues, achieve continuous improvement, and maximize profitability. Zontec is the only company that offers a product suite for all size companies. Committed to an aggressive product development schedule, Zontec software is created, tested, documented and totally supported within the company. This gives Zontec complete control over product development of our products. If a service agreement customer decides to upgrade to the next level of the Zontec product suite they can do so at minimal cost through our 100% Investment Retention program. They will be able to access all their previous data in the new product, minimizing production interruption. Zontec software has been adopted worldwide by more than 5,000 companies, spanning virtually every industrial category. Visit us at www.zontec-spc.com.

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